MEA
3.1
Mesh Sensor Monitor Users Guide

Document Revision 3.1.3

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Overview

The Mesh Sensor Monitor (MSM) application provides an interface that allows a user/operator to send or receive data from a remote wireless sensor node within a Mesh Enabled Architecture (MEA™) network. Sensor devices can be connected to the MEA wireless device via an RS-232 or an RS-485 interface. Mesh Sensor Monitor is designed as a debug tool for sensor network development, sensor/network integration, or third party development of sensor management applications. A Mesh Sensor API is available for third party development of custom sensor management applications.

Although MSM is used as the means for communicating directly with remote sensor devices, the MeshManager™ suite of Element Management software applications must be used to configure the serial interface on the MEA hardware (MWR6300/WSM6300). Configurable parameters include baud rate, packetization parameters (time interval, sync character, number of characters), GPIO configuration (input/output) and server IP address (the IP address of the host executing the MSM application).

Supported Operating Systems

- Microsoft Windows 2000
- Microsoft Windows XP

System Requirements

- Motorola Device Manager version 9.x.x or higher
- Mobile Wireless Router (MWR6300) / Mesh Sensor Monitor (MSM6300)

Installing Mesh Sensor Monitor

Insert the MEA Administration CD and install the Mesh Sensor Monitor application from */Software* directory. Double click on *SensorSetup.exe*. The MeshSensor Systems Setup dialog will be displayed.

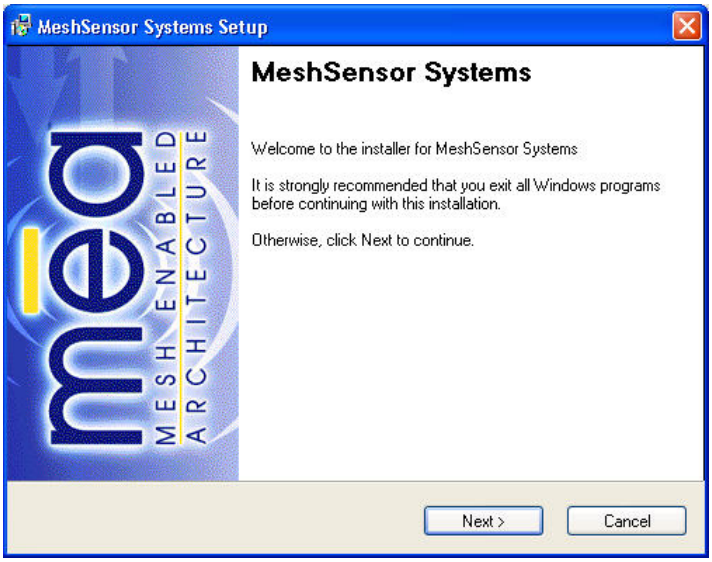

MeshSensor Systems Setup
MeshSensor Systems
Welcome to the installer for MeshSensor Systems
It is strongly recommended that you exit all Windows programs before continuing with this installation.
Otherwise, click Next to continue.
Next >
Cancel

Figure 1. MeshSensor Systems Setup – Initial Installation Dialog

Click on the **Next** button to display the *License Agreement* dialog.

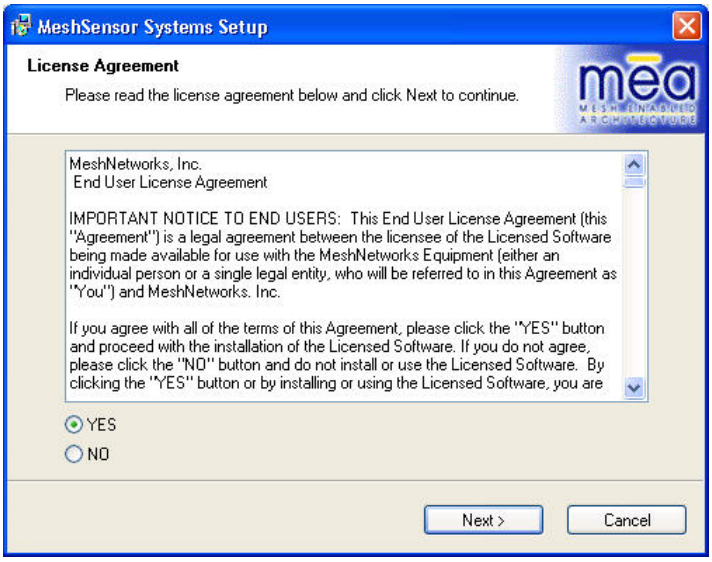

MeshSensor Systems Setup
License Agreement
Please read the license agreement below and click Next to continue.
MeshNetworks, Inc.
End User License Agreement
IMPORTANT NOTICE TO END USERS: This End User License Agreement (this "Agreement") is a legal agreement between the licensee of the Licensed Software being made available for use with the MeshNetworks Equipment (either an individual person or a single legal entity, who will be referred to in this Agreement as "You") and MeshNetworks, Inc.
If you agree with all of the terms of this Agreement, please click the "YES" button and proceed with the installation of the Licensed Software. If you do not agree, please click the "NO" button and do not install or use the Licensed Software. By clicking the "YES" button or by installing or using the Licensed Software, you are
YES
NO
Next >
Cancel

Figure 2. MeshSensor Systems Setup – License Agreement Dialog

After reading the License Agreement, select the *YES* radio button and click on the **Next** button to continue. When the *Ready to Install* dialog is displayed, confirm the default Install and Shortcut folders and click on the **Next** button to proceed with the installation.

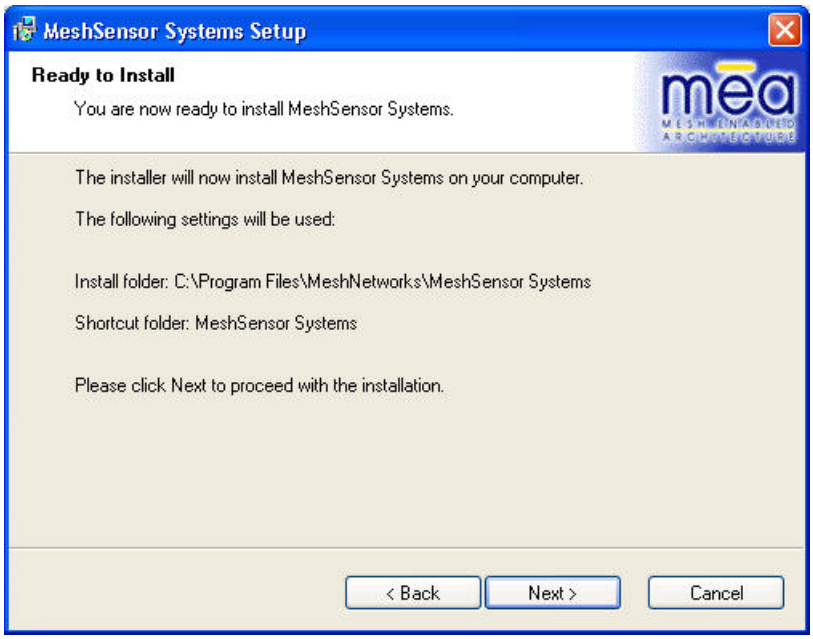

MeshSensor Systems Setup
Ready to Install
You are now ready to install MeshSensor Systems.
mea
The installer will now install MeshSensor Systems on your computer.
The following settings will be used:
Install folder: C:\Program Files\MeshNetworks\MeshSensor Systems
Shortcut folder: MeshSensor Systems
Please click Next to proceed with the installation.
< Back
Next >
Cancel

Figure 3. Ready to Install Dialog

If you have previously installed the Mesh Sensor Monitor application, the *Notice* dialog will be displayed. Click on the **Yes** button to confirm you wish to overwrite the existing *MSM.mdb* file.

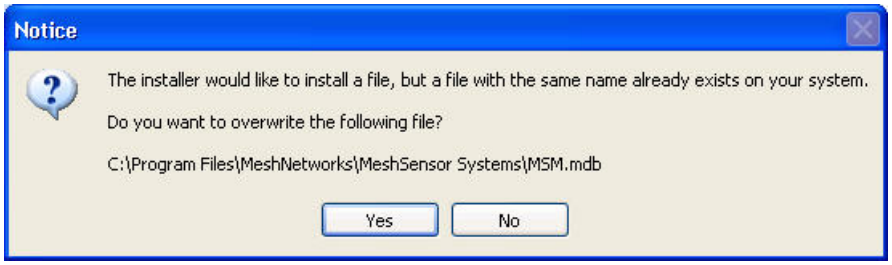

Notice
The installer would like to install a file, but a file with the same name already exists on your system.
Do you want to overwrite the following file?
C:\Program Files\MeshNetworks\MeshSensor Systems\MSM.mdb
Yes
No

Figure 4. Mesh Sensor Monitor Notice Dialog

For both initial installation and reinstallation of the Mesh Sensor Monitor application, the *Performing Setup Actions* dialog will be displayed.

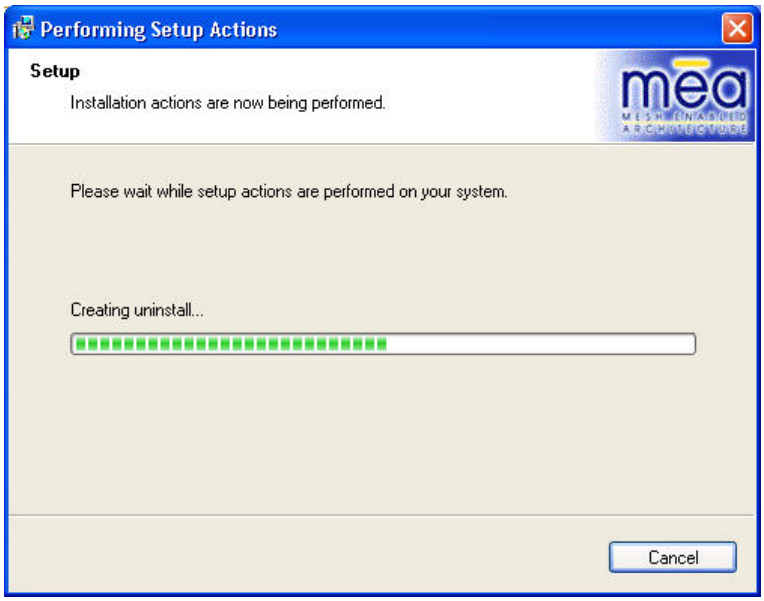


Figure 5. Performing Setup Actions Dialog

When all installation actions have been completed, the *MeshSensor Systems Installed Successfully* dialog will be displayed. Click on the **Finish** button to dismiss the dialog and complete the installation.

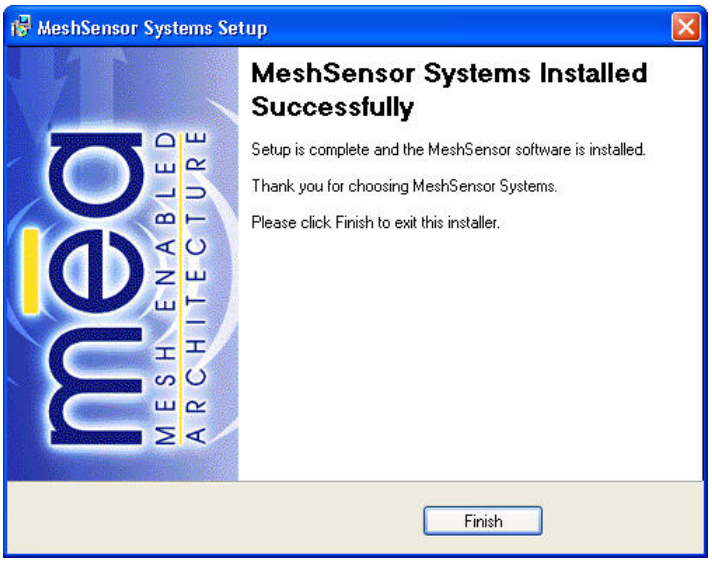

MeshSensor Systems Setup
MeshSensor Systems Installed Successfully
Setup is complete and the MeshSensor software is installed.
Thank you for choosing MeshSensor Systems.
Please click Finish to exit this installer.
Finish

Figure 6. MeshSensor Systems Installed Successfully Dialog

Operation

All functional operations for the MSM are performed using the Mesh Sensor Monitor Graphical User Interface (GUI).

Mesh Sensor Monitor Main Window

The Mesh Sensor Monitor (MSM) main window is shown in Figure 7.. This is the display configuration presented at application startup. This configuration presents four sub-windows, which are described in detail in the following sections.

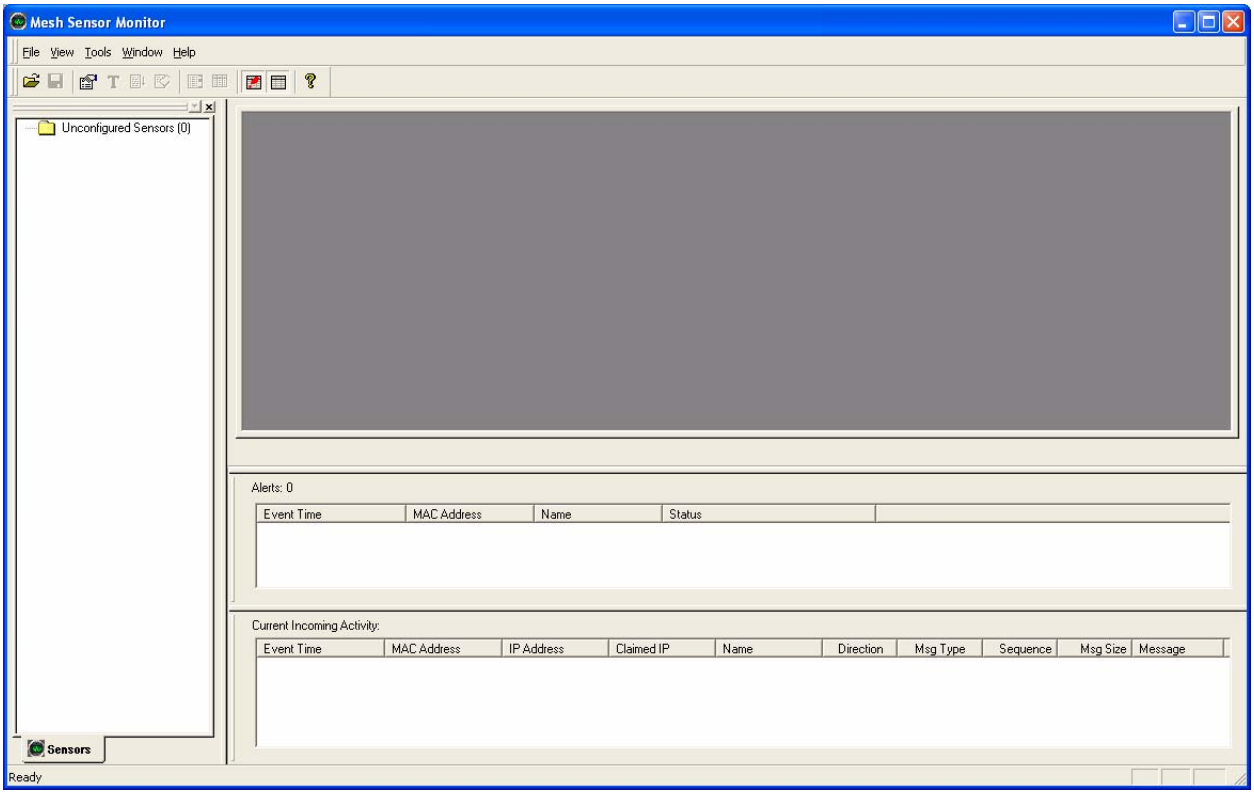


Figure 7. Mesh Sensor Monitor GUI

Sensor ID Window

The Sensor ID Window displayed on the *Sensors* tab shows a list of all sensors that have been discovered. Only active sensors are available to the user for communication. Active sensors are designated by a blinking green indicator displayed to the left of the corresponding MAC address. Devices can be sorted or identified by MAC address, IP address, name, or activity. To manage the device display attributes, right click on the device ID.

By default, any new sensor will initially be filed in the *Unconfigured Sensors* folder until additional configuration parameters are applied.

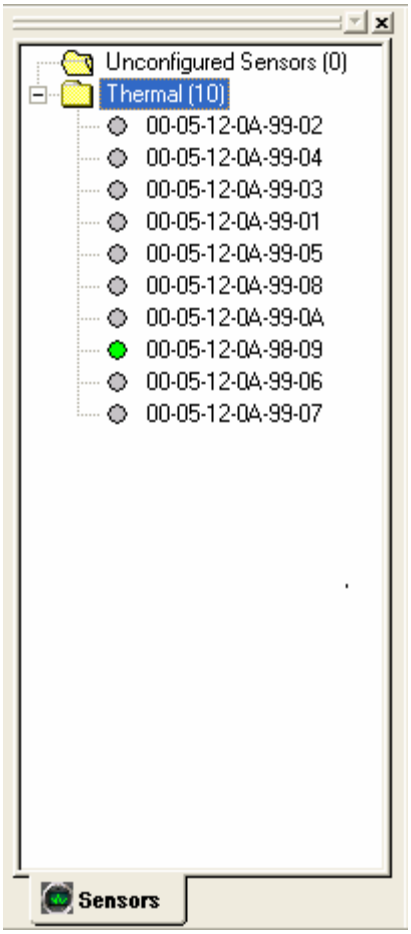


Figure 8. Sensor ID Window

Alert Window

The Alert Window displays certain events that may occur while the system is operating. These events are summarized by *Event Time*, *MAC Address*, *Name*, and the *Status*.

You can choose to either enable or disable display this window by selecting the Alert Window option under the Window menu.

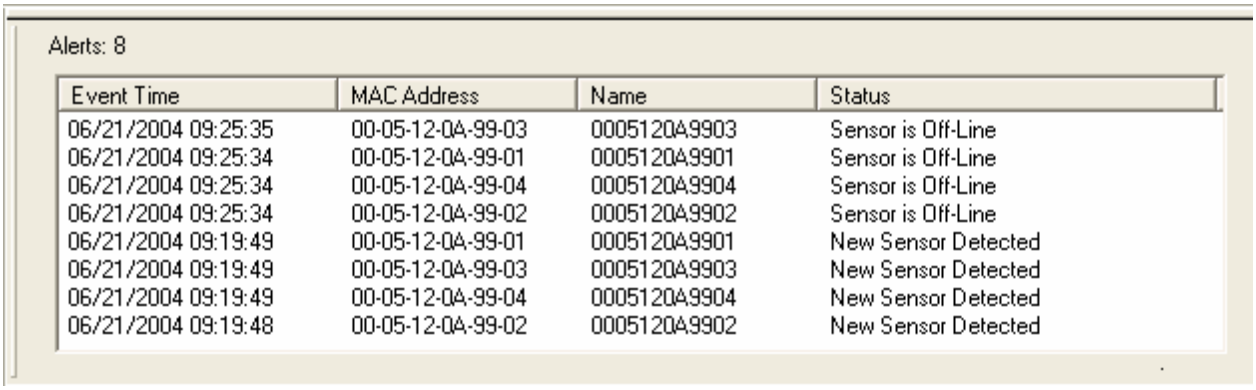


Figure 9. Alert Window

Alert Parameter	Description
Event Time	The date and time stamp for when the event that triggered the alert was captured.
MAC Address	The MAC address for the device being monitored.
Name	The name of the network node being monitored. The name displayed here will vary depending on the display attributes selected. The default display parameter is the MAC address formatted to remove hyphenation.
Status	The current status of the sensor device. One of the following Alert Status messages will be displayed: *New Sensor Detected* – Additional configuration parameters have been applied and a sensor has been detected and added to the network configuration. The device name will migrate from the *Unconfigured Sensors* folder to the appropriate network configuration folder in the Sensor ID Window. *Sensor is On-Line* – A sensor device that is currently configured in the network is on-line. *Sensor is Off-Line* – A sensor device that is currently configured in the network is off-line. *Sensor is Dead* – Communications cannot be established with a sensor device that is currently configured in the network.

Alert Parameter	Description
	Sensor is Resurrected – Communications have been restored for a sensor device that is currently configured in the network that was formerly unreachable.

Activity Window

The Activity Window displays message information, such as date and time, direction, sequence #, message size, and message data (text & hex) for the selected sensor.

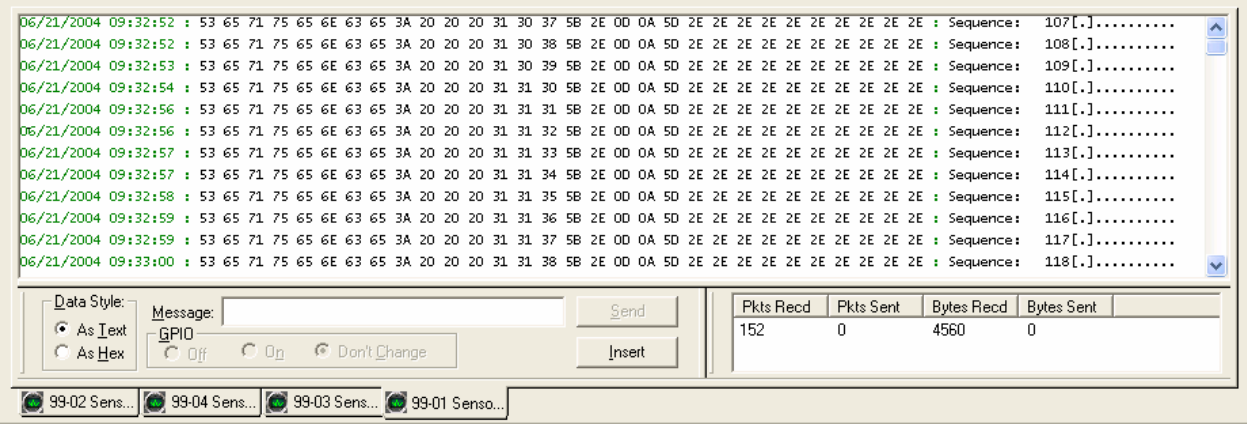


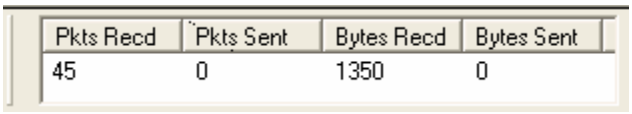
Figure 10. Sensor Activity Window

Activity Parameter	Description
Data Style	Using the radio buttons on the Data Style panel directly below the Activity Window, data to be transmitted to a sensor can be formatted to be relayed either *As Text* or *As Hex*. Text (character based), Hex, or a combination of Text and Hexidecimal messages can be sent to a sensor node.
Message	The data string to be transmitted to a sensor is entered in the *Message* field. The actual transfer of the data is initialized by clicking on the **Send** button.
GPIO	The General Purpose I/O (GPIO) pin can be configured for input, output, or transmit enable (RS-485 applications only) via MeshManager. The GPIO radio buttons for *Off*, *On*, and *Don't Change*. The **Insert** button is used to insert unprintable characters into a normal test message. See *Appendix A* for the ASCII character set.

As depicted at the bottom left of Figure 10, multiple Sensor Activity windows can be displayed simultaneously. Each window displayed will be identified by displaying a unique MAC address on the window tab for easy identification.

Node Data Summary Pane

The Node Data Summary Panel summarizes the number of data packets and bytes received and sent from the specified sensor node.



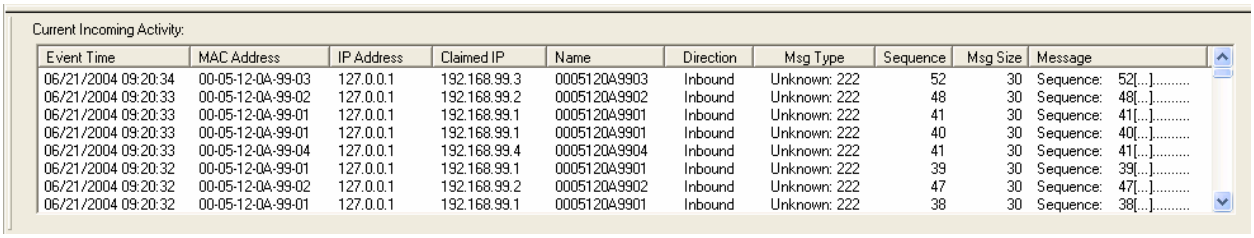
Pkts Recd	Pkts Sent	Bytes Recd	Bytes Sent
45	0	1350	0

Figure 11. Node Data Summary Pane

Current Incoming Activity Window

The *Current Incoming Activity* window is used to display serial modem activity that is currently visible to the host device executing the MSM application. The node table is populated automatically after active nodes have been selected from the Sensor ID window.

You can choose to either hide or show this window by selecting the Activity Window option under the Window menu.



Current Incoming Activity:

Event Time	MAC Address	IP Address	Claimed IP	Name	Direction	Msg Type	Sequence	Msg Size	Message
06/21/2004 09:20:34	00-05-12-0A-99-03	127.0.0.1	192.168.99.3	0005120A9903	Inbound	Unknown: 222	52	30	Sequence: 52[...].....
06/21/2004 09:20:33	00-05-12-0A-99-02	127.0.0.1	192.168.99.2	0005120A9902	Inbound	Unknown: 222	48	30	Sequence: 48[...].....
06/21/2004 09:20:33	00-05-12-0A-99-01	127.0.0.1	192.168.99.1	0005120A9901	Inbound	Unknown: 222	41	30	Sequence: 41[...].....
06/21/2004 09:20:33	00-05-12-0A-99-01	127.0.0.1	192.168.99.1	0005120A9901	Inbound	Unknown: 222	40	30	Sequence: 40[...].....
06/21/2004 09:20:33	00-05-12-0A-99-04	127.0.0.1	192.168.99.4	0005120A9904	Inbound	Unknown: 222	41	30	Sequence: 41[...].....
06/21/2004 09:20:32	00-05-12-0A-99-01	127.0.0.1	192.168.99.1	0005120A9901	Inbound	Unknown: 222	39	30	Sequence: 39[...].....
06/21/2004 09:20:32	00-05-12-0A-99-02	127.0.0.1	192.168.99.2	0005120A9902	Inbound	Unknown: 222	47	30	Sequence: 47[...].....
06/21/2004 09:20:32	00-05-12-0A-99-01	127.0.0.1	192.168.99.1	0005120A9901	Inbound	Unknown: 222	38	30	Sequence: 38[...].....

Figure 12. Current Incoming Activity Window

Current Incoming Activity Parameter	Description
Event Time	The date and time stamp for when the event that triggered the alert was captured.
MAC Address	The MAC address for the device being monitored.
IP Address	The IP address the message came from. Under normal conditions, this will be the same as the Claimed IP address. If the message passes through any device that does network address translation (NAT), then this address reflects the translated address.
Claimed IP	The IP address for the transceiver of the WSM6300.
Name	The name of the network node being monitored. The default display parameter is the MAC address

Current Incoming Activity Parameter	Description
	formatted to remove hyphenation. The default name can be changed using the sensor properties.
Direction	Messages being transmitted are identified as *Outbound* or *Inbound*.
Msg Type	Messages will be categorized by the following types:

Message Type #	Displayed Text
350	Serial Data
351	GPIO Status
352	Serial + GPIO
353	Serial + GPIO
354	Hello
Any Other	Unknown: nnn (where nnn is the message type # that was received)

Sequence	An increasing number that is created at the transceiver. The first message begins with zero and every new message increments by one.
Size	The size of the message in bytes. The actual number of bytes that came in the payload from the sensor. It does not include additional bytes added by the transceiver for header information.
Message	Message content displayed in a printable text format. Any nonprintable character in the message will be displayed as a period.

File Menu Options

The MSM makes use of several file types. The **.msm* file format is used to store sensor data communications activity. The **.smw* file format is used to store a specific workspace configuration for future access.

Open

To open a sensor data capture file, select *File → Open* from the main menu bar on the MSM GUI: Navigate to the appropriate directory and select the file to be opened.

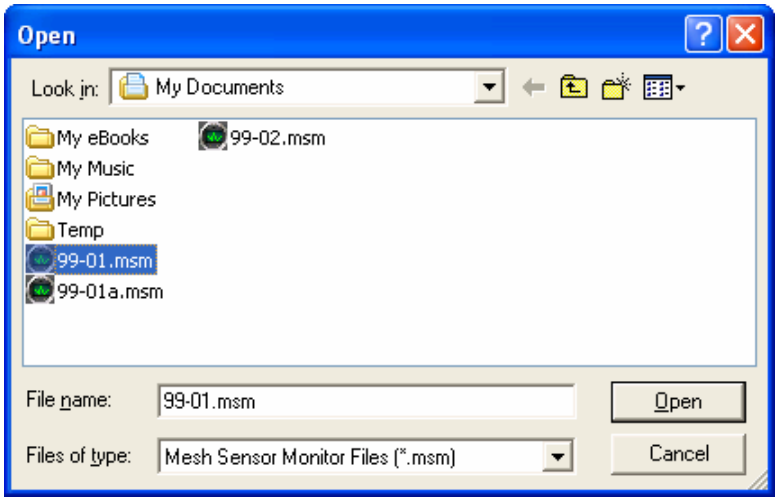


Figure 13. Windows File Open Dialog

Save As

To save a sensor data capture file, select *File → Save* from the main menu bar on the MSM GUI This will display the Windows *Save As* dialog. Navigate to the appropriate directory and select an existing file specify a new file name or to be overwritten.

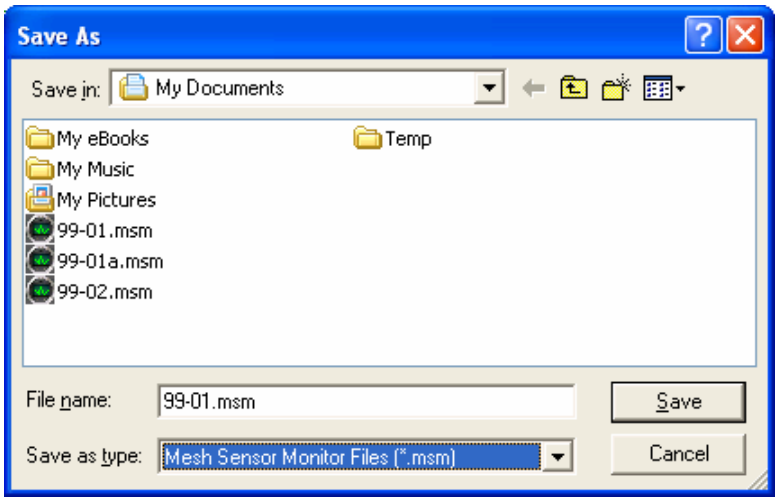


Figure 14. Windows File Save As Dialog

Workspace Configuration

Each window within the application can be repositioned by dragging and dropping the window to a new location. Workspace windows can also be resized by selecting and dragging the desired corner. An example of a reconfigured workspace is shown in Figure 15.

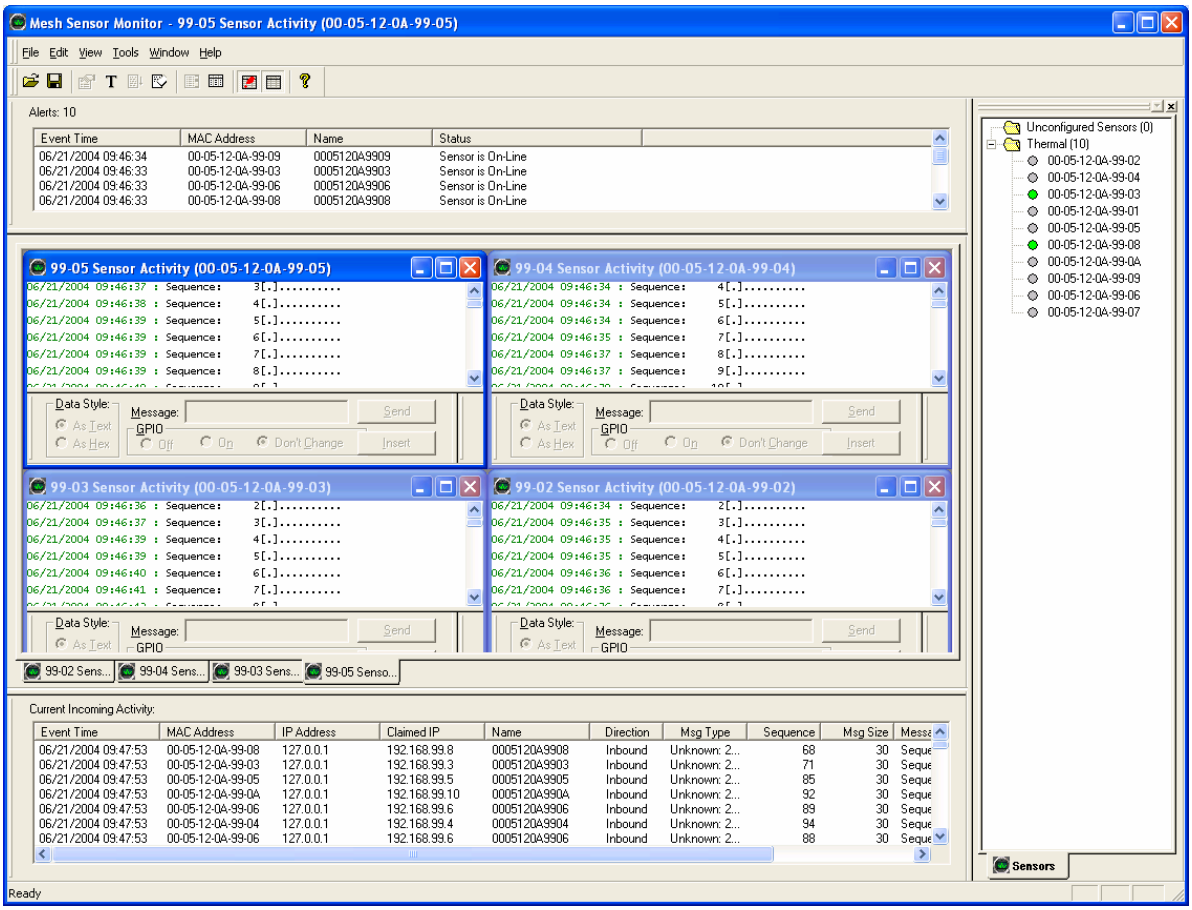


Figure 15. An Example of Workspace Configuration

After the workspace has been configured, the entire configuration for the workspace can then be saved as a *.*smw* file type.

NOTE: The Sensor Activity windows (4) shown above were configured using the Sensor Template and are configured to display data as ASCII with Timestamp.

Open Workspace

To open a workspace configuration file, select *File → Open Workspace* from the main menu bar on the MSM GUI. Navigate to the appropriate directory and select the file to be opened. Double click on the file name or click on the **Open** button.

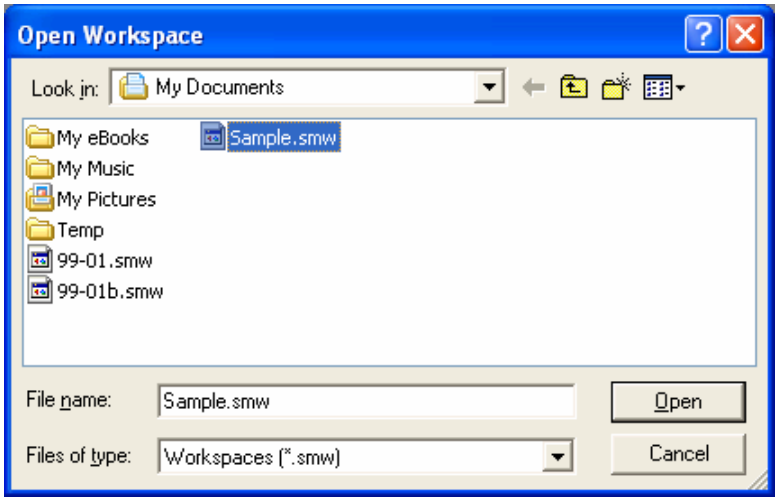


Figure 16. Open Workspace Dialog

Save Workspace

To save a workspace configuration file, select *File → Save Workspace* from the main menu bar on the MSM GUI. Navigate to the appropriate directory and select the file to be opened.

Close Workspace

This will close all monitor windows currently active.

Recent Workspaces

Workspaces that have recently been displayed will be listed in a drop-down menu to the right of the *recent Workspaces* option on the File drop-down menu.

View Menu Options

In addition to options for viewing different windows and toolbars, the View menu allows you to modify the parameters on the *Display (Sensor) Template*.

Log Entries

The Log Entries Window displays the following information for all current log entries.

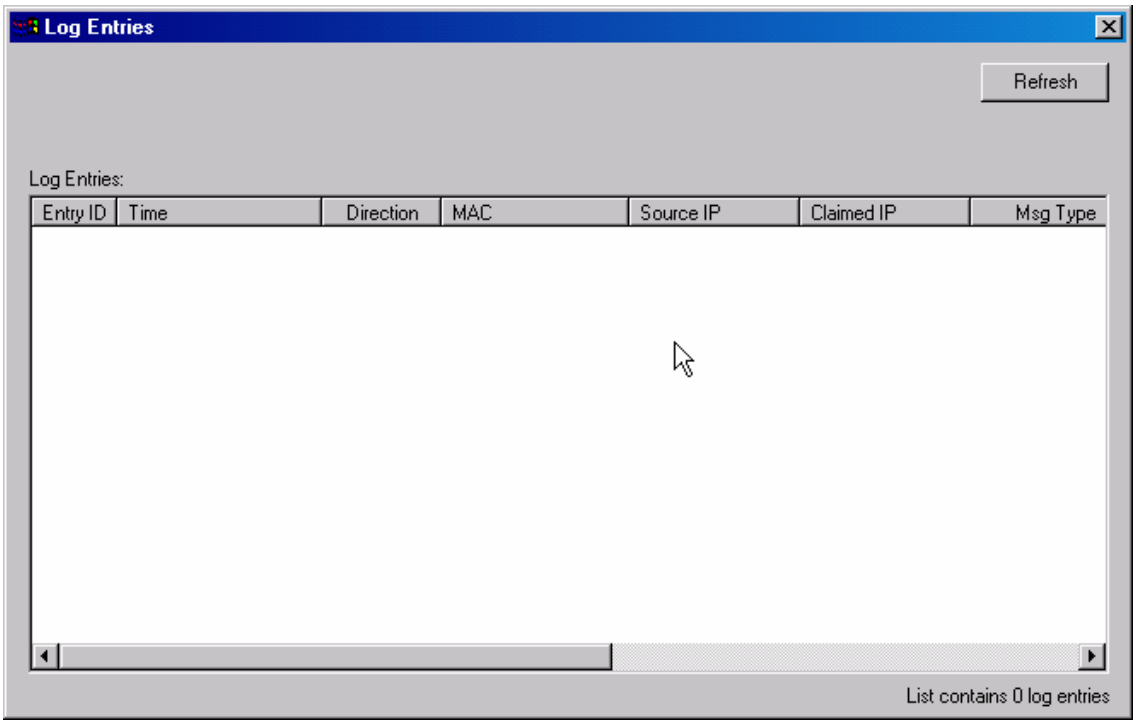


Figure 17. Log Entries Window

Log Entry Data Type	Description
Entry ID	A sequence number assigned by the system indicating the order in which the log entry was made.
Time	Time stamp for when the message was received.
Direction	Indicates whether the message was received (Inbound) or sent (Outbound).
MAC	MAC address for the device being monitored.
Source IP	Source IP address for the device being monitored.
Claimed IP	The IP address for the transceiver of the WSM6300.

Log Entry Data Type	Description
Msg Type	Messages will be categorized by the following types: *Message Type #* — *Displayed Text* 350 — Serial Data 351 — GPIO Status 352 — Serial + GPIO 353 — Serial + GPIO 354 — Hello Any Other — Unknown: nnn (where nnn is the message type # that was received)
Sequence	An increasing number that is created at the transceiver. The first message begins with zero and every new message increments by one.
Size	The size of the message in bytes. The actual number of bytes that came in the payload from the sensor. It does not include additional bytes added by the transceiver for header information.
Message	Message content displayed in a printable text format. Any nonprintable character in the message will be displayed as a period.

Sensor Templates View Window

Activating the Sensor Templates View Window displays the configuration parameters for existing sensor template in columnar format.

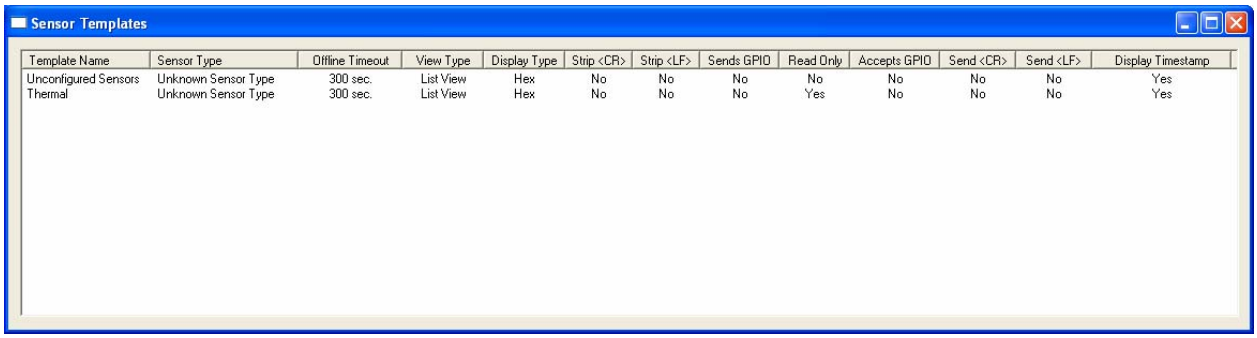


Figure 18. Sensor Templates View Window

Sensor Templates View Column Header	Description
Template Name	The name of the template whose parameters will apply to the group of sensors being monitored.
Sensor Type	User assigned sensor type. This can be changed using the Sensor Template.
Offline Timeout	The period in seconds that must elapse between messages before an offline alert is displayed in the Alert window.
View Type	Options are Scroll View or List View.
Display Type	Options are Hex or ASCII.
Strip <CR>	Strip Carriage Return characters from incoming data strings.
Strip <LF>	Strip Line Feed characters from incoming data strings.
Sends GPIO	If Sends GPIO is checked in the Sensor template, GPIO will be reported and displayed. If not checked, no information will be displayed.
Read Only	If a device is configured as read only, you cannot send data to that device.
Accepts GPIO	If Accepts GPIO is checked in the Sensor template, then you will be allowed to send the information to the sensor when you send a message.

Sensor Templates View Column Header	Description
Send <CR>	Send Carriage Return characters in outbound data strings.
Send <LF>	Send Line Feed characters in outbound data strings.
Display Timestamp	Display the timestamp.

Sensor Template

Each sensor in the Sensor ID Window can be uniquely configured using a sensor template. The template is accessed by double-clicking on the Sensor ID displayed in the Sensor ID Window. The Sensor Template display properties window is shown in Figure 19.

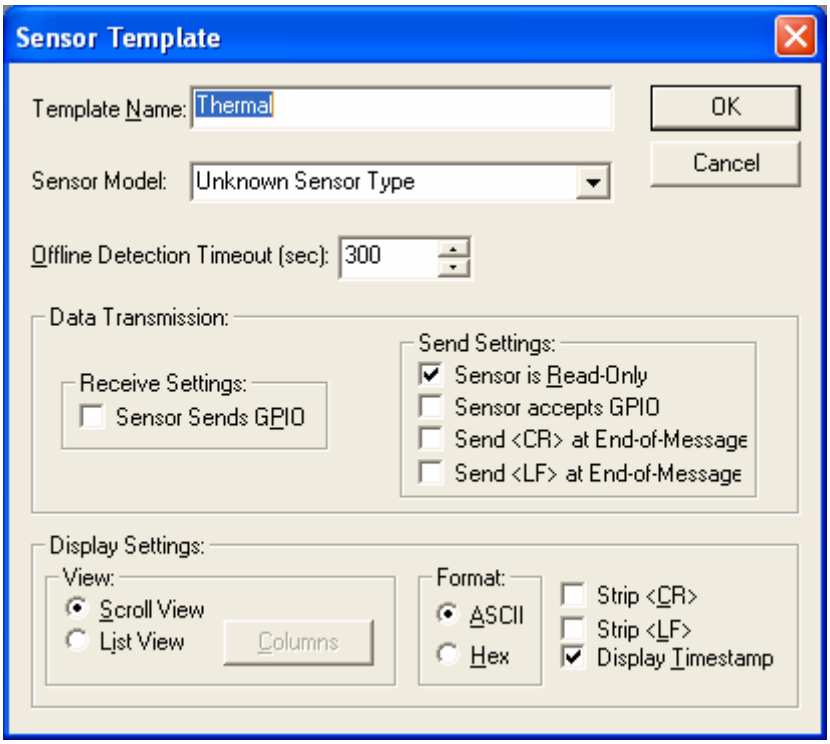


Figure 19. Sensor Template Display Properties Dialog

This template is used to configure many of the parameters used to transmit data to a specific sensor.

Sensor Template Parameter	Description
Template Name:	Existing or new name to be applied to the unique template developed for each sensor.

Sensor Template Parameter	Description
Sensor Model:	A user specified characteristic of the sensor to be used for reporting. The sensor model name should serve as a reminder of the type of sensor data being reported, the location of the sensor, etc.
Offline Detection Timeout (sec):	If no message is received within this timeout period, a sensor timeout is reported. A sensor timeout generally indicates a radio link failure.
Data Transmission:	
Receive Settings:	
Sensor Sends GPIO	GPIO is sourced by sensor.
Send Settings:	
Sensor is Read-Only	Must be deselected to send data to a sensor.
Sensor accepts GPIO	GPIO is sourced by sensor.
Send <CR> at End-of-Message	If checked, inserts carriage return character at the end of each data packet.
Send <LF> at End-of-Message	If checked, inserts line feed character at the end of each data packet.
Display Settings:	
View	
Scroll View	Displays data as a continuous data stream.
List View	Selecting *List View* and clicking the **Columns** button will bring up the User Defined Columns configuration dialog.
Format	
ASCII *(with or without timestamp)*	Data strings will be displayed in ASCII format.
Hex (with or without timestamp)	Data strings will be displayed in hexadecimal format.
Strip <CR>	Remove the carriage return characters from the displayed data.
Strip <LF>	Remove the line feed characters from the displayed data.
Display Timestamp	Include timestamp for all sensor information to be displayed.

When the *List View* display setting is selected on the Sensor Template display dialog (Figure 20), data can be labeled and delimited by columns. Column widths can be set by position and data width.

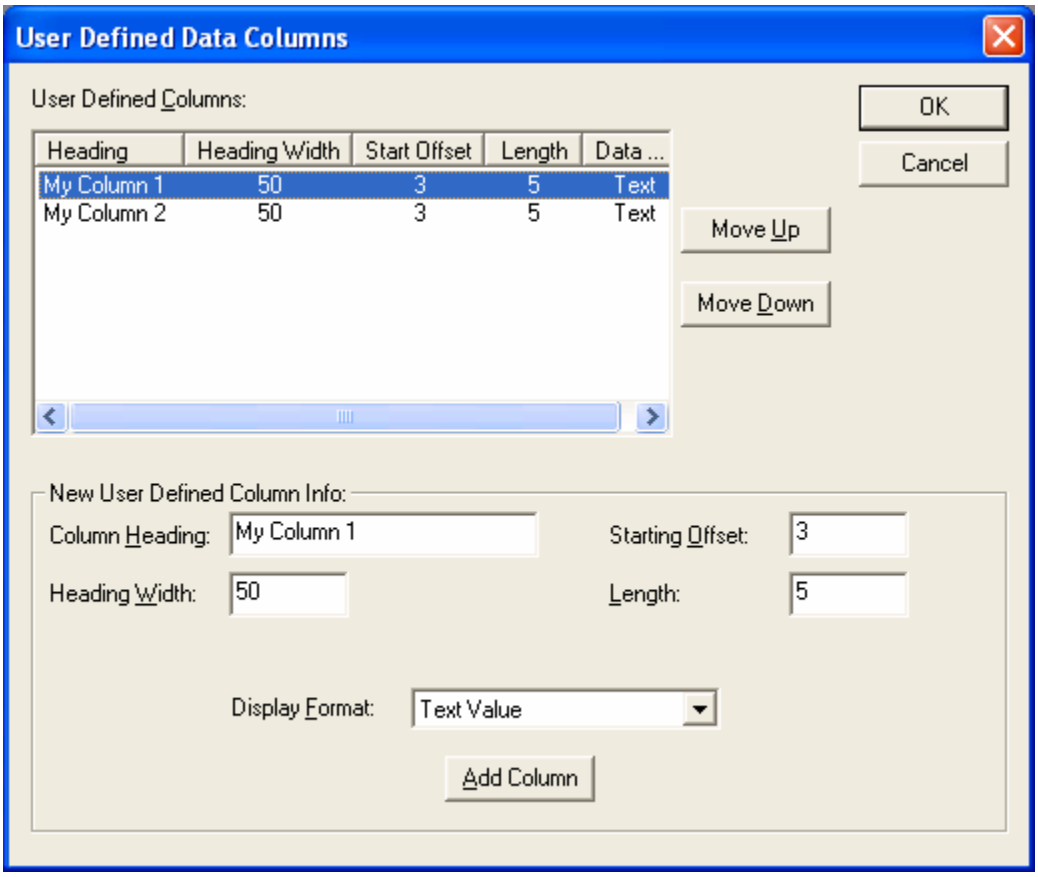


Figure 20. User Defined Data Columns Dialog

User Defined Data Columns Parameter	Definition
Heading	A logical title for the column of data to be displayed.
Heading Width	The width in characters of a specific data column.
Start Offset	The position, within a data packet, of the first data character to be displayed in a specific data column.
Length	The number of data characters to be displayed in a specific column.
Data Format	Display data ASCII or hexadecimal format.

Tools Menu Option

With MEA 3.1, Tools menu options are limited to *Customize*… . The *Customize* dialog has a *Toolbars* and a *Command* tab.

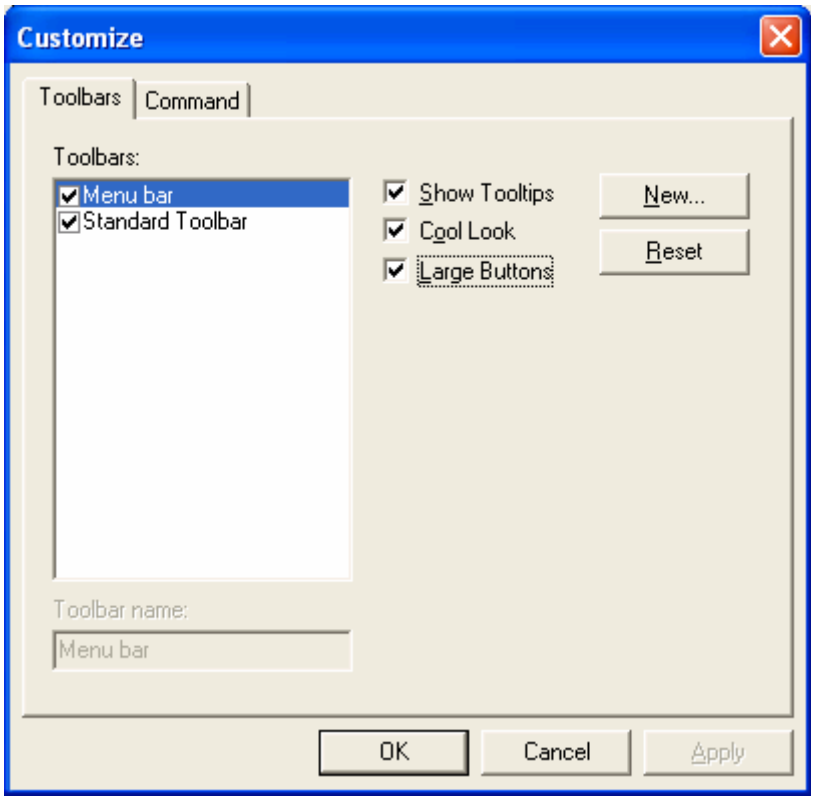


Figure 21. Tools Customize Dialog Toolbars Tab

Toolbars Tab

The Toolbars tab is used to select which toolbars will be displayed and to create new toolbars. The Menu and Standard toolbars are displayed in the *Toolbars*: pane by default. Deselect the checkbox for any toolbar you do not want to have displayed.

To create a new toolbar, click on the **New…** button to activate the New Toolbar dialog. Enter the name of the new toolbar in the *Toolbar name*: box and then click on the **OK** button. Click on the **Cancel** button to cancel the New Toolbar creation process.

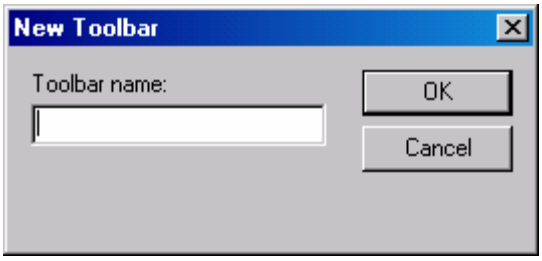


Figure 22. New Toolbar Dialog

When new toolbars are created, they will be added to the list in the *Toolbars*: display pane. To display any new toolbar, select the appropriate checkbox.

Click on the **Reset** button to reset the default parameters for the Menu and Standard toolbars. When selecting a new toolbar you have created, the **Reset** button will be replaced by the **Delete** button. This button allows you to delete any toolbars other than the Menu and Standard toolbars.

There are three checkboxes on the Toolbar tab. Selecting the *Show Tooltips* box will display information about the individual tool buttons on mouse over. Selecting *Cool Look* removes the three-dimensional shading from the toolbars and buttons. Selecting the *Large Buttons* checkbox changes the size of the icons on the Standard toolbar from the small default size to the larger icon size.

Figure 23. Large Button Display Option

Button Icon	Button Function Description
	Capture File Open
	Capture File Save

Display Template Properties

Change Font used for displaying sensor data

Enable or Disable Auto-Scroll in a Sensor Activity Window (only available in List View) - Disables automatic scrolling of new messages in window

Clear messages in selected Sensor Activity Window

Select Scroll View display for active Sensor Activity Window

Select List View display for active Sensor Activity Window

Enable or Disable display of Alert Window

Enable or Disable display of Current Activity window

Display the About box

For a more convenient display configuration, application subwindows may be configured to float on the desktop.

Command Tab

The Command tab is used to populate new toolbars with button icons from the Standard (default) toolbar or selections from the Menu toolbar. Click on the desired selection and drag and drop the button or menu selection item onto the new toolbar. Click on the **OK** button when you are finished or click on the **Cancel** button to dismiss the Customize dialog without saving the changes.

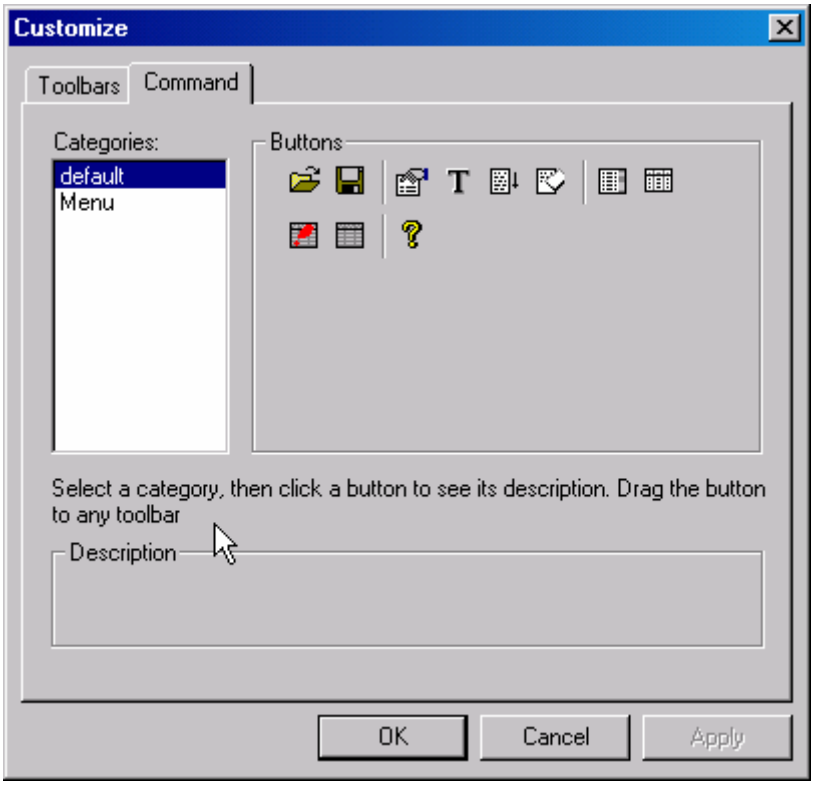


Figure 24. Tools Customize Dialog Command Tab

Window Menu Options

The Windows menu allows you to activate or deactivate the display of the Activity and Alert windows on the MSM GUI.

Help Menu Options

With MEA 3.1, the only Help option available is the *About Mesh Sensor Monitor* information panel.

Customer Service Information

If you have read this document and made every effort to resolve installation or operation issues yourself and still require help, please contact Motorola System Support Center (SSC) using the following contact information:

Hours of Operation

7 days a week, 24 hours

Technical Support: 800-221-7144 (USA)

Obtaining Support

Motorola provides technical support services for your system and recommends that you coordinate warranty and repair activities through the Motorola System Support Center (SSC). When you consult the Motorola SSC, you increase the likelihood that problems are rectified in a timely fashion and that warranty requirements are satisfied. Check your contract for specific warranty and service information.

System Information

To be provided with the best possible opportunity for support, collect the following system information and have it available when obtaining support.

- Location of the system
- Date the system was put into service
- Software or firmware version information for components of your system
- Serial number(s) of the device(s) or component(s) requiring support
- A written description of the symptom or observation of the problem:
  - When did it first appear?
  - Can it be reproduced?
  - What is the step-by-step procedure to cause it?
- Do other circumstances contribute to the problem? For example, changes in weather or other conditions?
- Maintenance action preceding problem:
  - Upgrade of software or equipment
  - Change in the hardware or software configuration
  - Software reload - from backup or from CD-ROM (note the version and date)

Return Material Request

After collecting system information, contact the Motorola System Support Center for assistance or to obtain a Return Material Authorization (RMA) number for faulty Field Replaceable Entities (FREs):

North America: 800-221-7144

Radio Products and Services Division

The Radio Products and Services Division is your source for manuals and replacement parts.

Radio Products and Services Division Telephone Numbers

The telephone numbers for ordering are: (800)-422-4210 (US and Canada orders)

The Fax numbers are: (800)-622–6210 (US and Canada orders)

The number for help identifying an item or part number is (800)-422-4210; select choice “3” from the menu

Returning System Components to Motorola

Motorola's service philosophy is based on field replaceable entities (FREs). FREs are system components identified by Motorola to be returned to Motorola for repair. In turn, Motorola sends you a replacement FRE component to help you maintain maximum operating performance for your system.

Returning FREs

Return faulty FREs to Motorola for repair. When you return an assembly for service, follow these best practices:

- Place any assembly containing CMOS devices in a static-proof bag or container for shipment.
- Obtain a return authorization (RA) number from the Motorola System Support Center.
- Include the warranty, model, kit numbers, and serial numbers on the job ticket, as necessary.
- If the warranty is out of date, you must have a purchase order.
- Print the return address clearly, in block letters.
- Provide a phone number where your repair technician can be reached.
- Include the contact person's name for return.
- Pack this assembly tightly and securely, preferably in its original shipping container.

Product Warranty Information

This warranty applies within the fifty (50) United States, the District of Columbia and Canada.

LIMITED WARRANTY
MOTOROLA COMMUNICATION PRODUCTS

If the affected product is being purchased pursuant to a written Communications System Agreement signed by Motorola, the warranty contained in that written agreement will apply. Otherwise, the following warranty applies.

I. WHAT THIS WARRANTY COVERS AND FOR HOW LONG:

Motorola Inc. or, if applicable, Motorola Canada Limited ("Motorola") warrants the Motorola manufactured Broadband Data communications product, against material defects in material and workmanship under normal use and service for a period of One (1) Year from the date of shipment.

Motorola, at its option, will at no charge either repair the Product (with new or reconditioned parts), replace it with the same or equivalent Product (using new or reconditioned Product), or refund the purchase price of the Product during the warranty period provided purchaser notifies Motorola according to the terms of this warranty. Repaired or replaced Product is warranted for the balance of the original applicable warranty period. All replaced parts of the Product shall become the property of Motorola.

This express limited warranty is extended by Motorola to the original end user purchaser purchasing the Product for purposes of leasing or for commercial, industrial, or governmental use only, and is not assignable or transferable to any other party. This is the complete warranty for the Product manufactured by Motorola. Motorola assumes no obligations or liability for additions or modifications to this warranty unless made in writing and signed by an officer of Motorola. Unless made in a separate written agreement between Motorola and the original end user purchaser, Motorola does not warrant the installation, maintenance or service of the Product.

Motorola cannot be responsible in any way for any ancillary equipment not furnished by Motorola which is attached to or used in connection with the Product, or for operation of the Product with any ancillary equipment, and all such equipment is expressly excluded from this warranty. Because each system which may use the Product is unique, Motorola disclaims liability for range, coverage, or operation of the system as a whole under this warranty.

II. GENERAL PROVISIONS:

This warranty sets forth the full extent of Motorola's responsibilities regarding the Product. Repair, replacement or refund of the purchase price, at Motorola's option, is the exclusive remedy. THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER EXPRESS WARRANTIES. MOTOROLA DISCLAIMS ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL MOTOROLA BE LIABLE FOR DAMAGES IN EXCESS OF THE PURCHASE PRICE OF THE PRODUCT, FOR ANY LOSS OF USE, LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS, LOST PROFITS OR SAVINGS OR OTHER INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE SUCH PRODUCT, TO THE FULL EXTENT SUCH MAY BE DISCLAIMED BY LAW.

III. HOW TO GET WARRANTY SERVICE:

Purchaser must notify Motorola's representative or call Motorola's Customer Response Center at 1-800-247-2346 within the applicable warranty period for information regarding warranty service.

IV. WHAT THIS WARRANTY DOES NOT COVER:

A) Defects or damage resulting from use of the Product in other than its normal and customary manner.
B) Defects or damage from misuse, accident, water, or neglect.
C) Defects or damage from improper testing, operation, maintenance, installation, alteration, modification, or adjustment.
D) Breakage or damage to antennas unless caused directly by defects in material workmanship.
E) A Product subjected to unauthorized Product modifications, disassemblies or repairs (including, without limitation, the addition to the Product of non-Motorola supplied equipment) which adversely affect performance of the Product or interfere with Motorola's normal warranty inspection and testing of the Product to verify any warranty claim.
F) Product which has had the serial number removed or made illegible.
G) Batteries (they carry their own separate limited warranty).
H) Freight costs to the repair depot.
I) A Product which, due to illegal or unauthorized alteration of the software/firmware in the Product, does not function in accordance with Motorola's published specifications or with the FCC type acceptance labeling in effect for the Product at the time the Product was initially distributed from Motorola.
J) Scratches or other cosmetic damage to Product surfaces that does not affect the operation of the Product.
K) That the software in the Product will meet the purchaser's requirements or that the operation of the software will be uninterrupted or error-free.
L) Normal and customary wear and tear.
M) Non-Motorola manufactured equipment unless bearing a Motorola Part Number in the form of an alpha numeric number (i.e., TDE6030B).

N) Lift trucks for installation, removal, replacement or repair of the Motorola supplied products from light, power, telephone poles etc.

O) Dispatch to remote site locations

P) Loading of software upgrades or fixes into the devices.

V. GOVERNING LAW

In the case of a Product sold in the United States and Canada, this Warranty is governed by the laws of the State of Illinois and the Province of Ontario, respectively.

VI. PATENT AND SOFTWARE PROVISIONS:

Motorola will defend, at its own expense, any suit brought against the end user purchaser to the extent that it is based on a claim that the Product or its parts infringe a United States patent, and Motorola will pay those costs and damages finally awarded against the end user purchaser in any such suit which are attributable to any such claim, but such defense and payments are conditioned on the following:

A) that Motorola will be notified promptly in writing by such purchaser of any notice of such claim;
B) that Motorola will have sole control of the defense of such suit and all negotiations for its settlement or compromise; and
C) should the Product or its parts become, or in Motorola's opinion be likely to become, the subject of a claim of infringement of a United States patent, that such purchaser will permit Motorola, at its option and expense, either to procure for such purchaser the right to continue using the Product or its parts or to replace or modify the same so that it becomes non-infringing or to grant such purchaser a credit for the Product or its parts as depreciated and accept its return. The depreciation will be an equal amount per year over the lifetime of the Product or its parts as established by Motorola.

Motorola will have no liability with respect to any claim of patent infringement which is based upon the combination of the Product or its parts furnished hereunder with software, apparatus or devices not furnished by Motorola, nor will Motorola have any liability for the use of ancillary equipment or software not furnished by Motorola which is attached to or used in connection with the Product. The foregoing states the entire liability of Motorola with respect to infringement of patents by the Product or any its parts thereof.

Laws in the United States and other countries preserve for Motorola certain exclusive rights for copyrighted Motorola software such as the exclusive rights to reproduce in copies and distribute copies of such Motorola software. Motorola software may be used in only the Product in which the software was originally embodied and such software in such Product may not be replaced, copied, distributed, modified in any way, or used to produce any derivative thereof. No other use including, without limitation, alteration, modification, reproduction, distribution, or reverse engineering of such Motorola software or exercise of rights in such Motorola software is permitted. No license is granted by implication, estoppel or otherwise under Motorola patent rights or copyrights.

Appendix A

dec	ASCII	
0	NUL	Null
1	SOH	Start of Heading (CC)
2	STX	Start of Text (CC)
3	ETX	End of Text (CC)
4	EOT	End of Transmission (CC)
5	ENQ	Enquiry (CC)
6	ACK	Acknowledge (CC)
7	BEL	Bell
8	BS	Backspace (FE)
9	HT	Horizontal Tabulation (FE)
10	LF	Line Feed (FE)
11	VT	Vertical Tabulation (FE)
12	FF	Form Feed (FE)
13	CR	Carriage Return (FE)
14	SO	Shift Out
15	SI	Shift In
16	DLE	Data Link Escape (CC)
17	DC1	Device Control 1
18	DC2	Device Control 2
19	DC3	Device Control 3
20	DC4	Device Control 4
21	NAK	Negative Acknowledge (CC)
22	SYN	Synchronous Idle (CC)
23	ETB	End of Transmission Block (CC)
24	CAN	Cancel
25	EM	End of Medium
26	SUB	Substitute
27	ESC	Escape
28	FS	File Separator (IS)
29	GS	Group Separator (IS)
30	RS	Record Separator (IS)
31	US	Unit Separator (IS)

dec	ASCII	
32	SP	Space
33	!	Exclamation Point
34	"	Quotation Mark
35	#	Number Sign, Octothorp, "pound"
36	$	Dollar Sign
37	%	Percent
38	&	Ampersand
39	'	Apostrophe, Prime
40	(	Left Parenthesis
41	)	Right Parenthesis
42	*	Asterisk, "star"
43	+	Plus Sign
44	,	Comma
45	-	Hyphen, Minus Sign
46	.	Period, Decimal Point, "dot"
47	/	Slash, Virgule
48	0	0
49	1	1
50	2	2
51	3	3
52	4	4
53	5	5
54	6	6
55	7	7
56	8	8
57	9	9
58	:	Colon
59	;	Semicolon
60	<	Less-than Sign
61	=	Equal Sign
62	>	Greater-than Sign
63	?	Question Mark
64	@	At Sign
65	A	A
66	B	B
67	C	C
68	D	D
69	E	E
70	F	F
71	G	G
72	H	H

dec	ASCII	
73	I	I
74	J	J
75	K	K
76	L	L
77	M	M
78	N	N
79	O	O
80	P	P
81	Q	Q
82	R	R
83	S	S
84	T	T
85	U	U
86	V	V
87	W	W
88	X	X
89	Y	Y
90	Z	Z
91	[	Opening Bracket
92	\	Reverse Slant
93	]	Closing Bracket
94	^	Circumflex, Caret
95	_	Underline, Underscore
96	`	Grave Accent
97	a	a
98	b	b
99	c	c
100	d	d
101	e	e
102	f	f
103	g	g
104	h	h
105	i	i
106	j	j
107	k	k
108	l	l
109	m	m
110	n	n
111	o	o
112	p	p
113	q	q
114	r	r
115	s	s
116	t	t

dec	ASCII	
117	u	u
118	v	v
119	w	w
120	x	x
121	y	y
122	z	z
123	{	Opening Brace
124	|	Vertical Line
125	}	Closing Brace
126	~	Tilde
127	DEL	Delete
128		Reserved